JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES
VOL. 14 APRIL 19, 1924 No. 8

PHYSICAL CHEMISTRY.—*The densities and specific volumes of sodium chloride solutions at 25°.*[1] RALPH E. HALL, Geophysical Laboratory, Carnegie Institution of Washington.

INTRODUCTION

This work was undertaken because of a need for accurate specific volume data on concentrated sodium chloride solutions at 25°. The data available, reference to which will be made later, either did not meet the necessary requirements of concentration, or else required an interpolation over a wide range of temperature or concentration.

APPARATUS AND MATERIALS

Pycnometers.—The type of pycnometer used is shown in Fig. 1, and is similar to that described by Bousfield.[2] While Bousfield's procedure was such that he hung the pycnometer in the thermostat by a convenient support, the pycnometers used in this work were placed in a wire basket which supported them during the time they were in the thermostat, so that they were subject to practically no strain.

Thermostat and temperature control.—The thermostat was a well lagged, porcelain-lined vessel of about 15 gallons (57 liters) capacity. The stirring was thorough. Heat was furnished by a resistance element so connected with lamps in parallel that the make and break of the relay produced only a slight variation in the current passing through it. The relay was of a special type with carbon contacts, and the periods between make and break were of 30 to 40 seconds duration. A mercury regulator was used. The pycnometer was

[1] Received March 3, 1924.
[2] Journ. Chem. Soc. London, **93**: 679. 1908.

always placed in the same position in the thermostat, and close beside it was one leg of a 10-junction thermel, the reference leg being immersed in ice in a thermos bottle. The thermel was calibrated by comparison with Dr. L. H. Adams' 50 junction element which had been calibrated by comparison with the 24-junction standard element of this laboratory, made by Dr. Walter P. White and calibrated by the Bureau of Standards. The e.m.f. of the thermel was read by means of a Wolff potentiometer, the standard cell of which was checked by the Bureau of Standards shortly after the work was done. A millimeter division on the scale represented 0.0025°; and the temper-

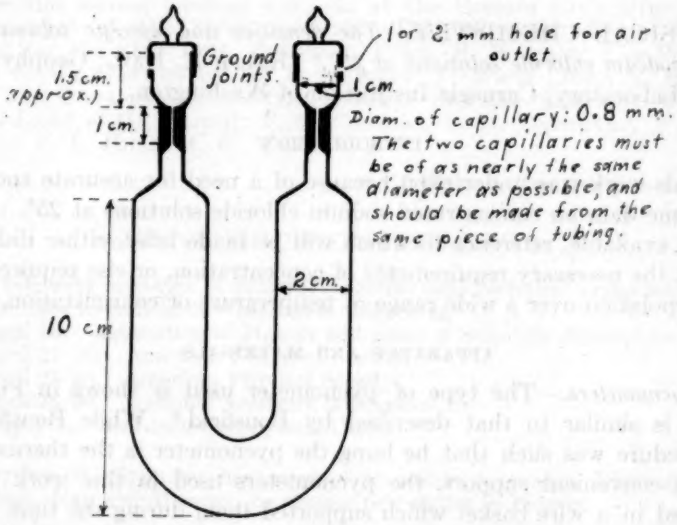
Ground joints.
1.5 cm. (approx.)
1 cm.
1 or 2 mm. hole for air outlet.
1 cm.
Diam. of capillary: 0.8 mm.
The two capillaries must be of as nearly the same diameter as possible, and should be made from the same piece of tubing.
2 cm.
10 cm

Fig. 1.—Pycnometer used for the determination of the densities of sodium chloride solutions at 25°.

ature of the thermostat was maintained constant within this limit at the point at which the thermel was inserted. It was our intention to work at 25°; but when the certificate on the standard cell was available, we found that our temperature was 25.01°. All final results have been corrected to 25°.

The balance.—This was a high grade Ainsworth balance. The ratio of the arms (L/R) was 1.000 000 3, so that in double weighing, which was followed throughout the work, only a slight difference in the weights resulted by exchanging load and weights. The results of all

weighings were reduced to vacuum, the barometer reading and the temperature and humidity in the balance case being recorded at the time of each weighing.

The weights.—The weights used were calibrated just prior to this work by comparison with the standard weights of this laboratory, certified by the Bureau of Standards.

Water.—Ordinary distilled water was distilled from alkaline permanganate, and collected in an atmosphere of steam. It was kept in tightly stoppered bottles. This water had a conductivity at 25° of about 2×10^{-6}. Before use it was heated to boiling again, and then quickly cooled before its introduction into the pycnometer. At no time did any bubbles become apparent in the pycnometer after the necessary time in the thermostat for temperature equilibrium to be reached.

Salt.—Squibb's "Reagent" sodium chloride was used. It was once recrystallized by solution in water and evaporation to half recovery. These crystals were sucked comparatively dry, washed once with distilled water, air dried until all tendency to adhere together or to the glass had disappeared, and finally subjected in platinum dishes to a temperature of 500 to 600° for 5 to 8 hours.

Solutions.—All solutions were made up entirely independently. The salt was weighed in a platinum dish, transferred to a funnel, and washed into a 100 cc. "R" volumetric flask, whose weight was known, with the hot water used in making the solution. The body of the flask was nearly filled with hot water, and given a swirling motion until the salt was all dissolved, when enough water was added to bring the solution about a centimeter above the mark. The flask, stoppered, was now placed in a large beaker of distilled water at room temperature for ten or fifteen minutes, then was removed, wiped off carefully with a linen cloth, and placed in the balance case. At the end of half an hour, it was double weighed, no tare being used. The contents of the flask were now thoroughly mixed, so that the solution was homogeneous, and were transferred to the dry pycnometer. By this procedure, the amount of air taken up by the solution was kept small enough so that no bubbles ever appeared on the surface of the pycnometer.

EXPERIMENTAL PROCEDURE

When the pycnometer was first introduced into the thermostat, the little cups above the capillaries were partially filled with solution.

After about five minutes, this excess solution was removed by absorption in filter paper. After ten minutes more, a first adjustment to the marks on the capillaries was made. The pycnometer was left in the thermostat about fifteen minutes more, and further adjustment made if necessary. Before its removal from the bath, the cups were wiped out with dampened filter paper, to remove any traces of salt which might have collected. Both the tare and the pycnometer containing the solution were dipped into distilled water and wiped with a damp linen cloth, whereupon they were hung in the balance case. Equilibrium as to weight was reached in a half hour's time.

TABLE 1.—CONSTANCY OF THE RELATION BETWEEN THE SOLUTION-PYCNOMETER AND THE TARE-PYCNOMETER DURING THE EXPERIMENTAL WORK

AFTER	(TARE-PYCNOMETER)-(SOLUTION-PYCNOMETER)
8 water determinations	0.00130 grams
1 salt solution determination	0.00142
2 salt solution determination	0.00152
2 salt solution determination	0.00142
4 salt solution determination	0.00139
5 salt solution determination	0.00130
Average.....	0.0014

In making the corrections to vacuum, the density of the solution was considered to be its density at 25°. No appreciable error was introduced by this assumption, as the temperature of the balance case varied only from 21 to 25°.

WEIGHT CONSTANCY OF THE SOLUTION PYCNOMETER

The constancy of the relation between the pycnometer used as a tare and the one used to hold the solutions is illustrated by the figures of table 1, which were obtained, as indicated by column 1, at the various intervals in the series of experiments. Before each comparison, and also before each determination of weight of solution, the solution-pycnometer was washed out with bichromate cleaning fluid, then with distilled water, and dried by sucking air through it. No precautions were taken to filter the air, as the room was quite free from dust.

The consistency of the results presented in column 2 leads to the conclusion that errors from any dissolving of the surfaces are negligible. The first three water determinations of the eight mentioned in column 1 were discarded, as they were made using the upper marks

on the capillaries, and it was found that better adjustment could be obtained by using the lower marks. In all calculations, the difference between tare- and solution-pycnometer was taken as 0.0014 gram.

VOLUME OF THE SOLUTION-PYCNOMETER

The determinations with pure water for obtaining the volume of the solution-pycnometer resulted as follows:

NUMBER OF DETERMINATION	WEIGHT OF WATER (GRAMS)
1	54.8779
2	54.8771
3	54.8772
4	54.8791
5	54.8774
6	54.8778
Average (exclusive of No. 4).....	54.8775

Nos. 1–5 were made before using the pycnometer with the solutions; No. 6 was made at the close of the work. No. 4 has been omitted from the average, as the pycnometer was filled in the evening, and

TABLE 2.—SUMMARY OF DETERMINATIONS ON NaCl SOLUTIONS

WEIGHT OF SALT	WEIGHT OF SOLUTION	CONCENTRATION, PER CENT	WEIGHT OF SOLUTION IN PYCNOMETER	DENSITY 25.01°/4°	DENSITY 25°/4°
1.0017	100.4946	0.99673	55.2647	1.00410_3	1.00410_6
2.0586	101.8605	2.0210	55.6620	1.01132_2	1.01132_5
5.0123	103.8832	4.8249	56.7582	1.03123_8	1.03124_1
5.0027	103.8421	4.8176	56.7558	1.03119_5	1.03119_8
10.8000	108.0488	9.9955	58.8257	1.06880_3	1.06880_7
10.7999	108.1625	9.9849	58.8216	1.06872_8	1.06873_2
16.6095	112.0600	14.8220	60.8205	1.10504_8	1.10505_0
16.6094	112.0548	14.8226	60.8209	1.10505_3	1.10505_7
22.9611	115.2032	19.9310	63.0132	1.14488_5	1.14488_9
28.2654	118.0699	23.9395	64.8004	1.17735_7	1.17736_2
29.6630	118.9756	24.9320	65.2531	1.18558_2	1.18558_7
29.6630	119.0305	24.9205	65.2484	1.18549_7	1.18550_2
30.8239	120.8316	25.5098	65.5183	1.19040_0	1.19040_5

left in the thermostat all night, final adjustment being made the following morning; whereas in all other determinations, both water and solutions, the pycnometer remained in the thermostat about an hour after its introduction.

The volume of the pycnometer at 25.01° is 55.0389 milliliters.

DETERMINATIONS ON SOLUTIONS OF SODIUM CHLORIDE

The complete data of the determinations are contained in table 2. In table 3, the slight changes necessary to reduce check determinations to the same per cent have been made. A curve through 0, 4.8250, 14.8220, and 24.9320 per cent has the following form, in which p represents per cent by weight:

$$D_p = 0.997\,071 + 0.007\,010\,9p + 0.000\,013\,268p^2 + 0.000\,000\,353\,5p^3$$

TABLE 3.—DENSITIES OF NaCl SOLUTIONS AT 25°, ALL CHECK DETERMINATIONS CORRECTED TO THE SAME CONCENTRATION

CONCENTRATION, PER CENT	$D_{t°}^{m°}$	FINAL VALUES $D_{t°}^{m°}$	CALCULATED VALUES, $D_{4°}^{m°}$	$D_{obs.} - D_{Calc.} \times 10^6$
0.99673	1.00410_6	1.00410_6	1.00407_3	33
2.0210	1.01132_5	1.01132_5	1.01129_7	28
4.8250	1.03124_3	1.03124_7		0
	1.03125_1			
9.9955	1.06880_7	1.06880_9	1.06882_7	−18
	1.06881_0			
14.8220	1.10505_0	1.10505_2		0
	1.10505_3			
19.9310	1.14488_9	1.14488_9	1.14487_5	14
23.9395	1.17736_2	1.17736_2	1.17736_2	0
24.9320	1.18558_7	1.18559_2		0
	1.18559_7			
25.5100	1.19040_1	1.19040_5	1.19042_1	−16

TABLE 4.—DENSITY AND SPECIFIC VOLUME OF NaCl SOLUTIONS AT 25° AT ROUNDED CONCENTRATIONS

CONCENTRATION PER CENT	$D_{4°}^{m°}$				Sp. vol. MILLILITERS PER GRAM
	Hall	Bousfield	Baxter	Baxter	Hall
0.0	(0.997071)	(0.997071)	(0.997071)	(0 997071)	(1.00294)
0.5	1.00060_0	1.00061	1.00060	1 00055	0.99940
1.0	1.00412_2	1.00416	1.00412	1.00402	0.99589
2.0	1.01117_7	1.01122	1.01115	1.01102	0.98895
3.0	1.01825_0	1.01830	1.01817	1.01808	0.98208
5.0	1.03250_0	1.03250	1.03246	1.03234	0.96852
10.0	1.06884_2	1.06902	1.06881	1.06881	0.93559
15.0	1.10641_4	1.10663	1.10637	1.10648	0.90382
20.0	1.14543_8	1.14552	1.14539		0.87303
25.0	1.18615_7	1.18617	1.18608		0.84306

Column 4 of table 3 contains the values obtained from calculation with this equation; column 5 shows the difference between observed and

calculated values. A divergence curve, constructed on the basis of these differences, allows interpolations to be made with accuracy. In this manner, the figures of table 4, column 2, for our values at rounded concentrations have been obtained.

LIMITS OF PRECISION

The maximum divergence from the mean in the determination of the water content of the pycnometer was slightly more than 7 parts per million. In check determinations of the densities at four different concentrations, the greatest divergence from the mean was 5 parts in a little more than a million. Presumably the water content, the mean of five determinations, is accurate to 5 in the sixth decimal place; it therefore defines the limit of precision of the density determinations as the same figure.

Determinations on the density of sodium chloride solutions over the range of concentration and temperature presented here have been made by Bousfield[3] and Baxter,[4] the former at the temperatures 7°, 20° and 33°, the latter at 25° and other temperatures. Their values have been reduced to rounded concentrations by interpolation and by divergence curves, and are presented in columns 2, 3, and 4 of table 4. The reader is referred to the original articles for a critical consideration of methods employed and limits of precision. It should be noted, however, that the accuracy of the present work was enhanced by the very exact adjustments possible in the type of pycnometer used, and by the small changes in temperature to which the pycnometers were subjected.

The last column of table 4 contains the specific volumes in milliliters per gram at rounded concentrations calculated from the data of column 1.

SUMMARY

The densities and specific volumes of sodium chloride solutions at 25°C. and at concentrations up to 25.5 per cent are presented. They have been determined with an accuracy of 5 parts per million.

[3] BOUSFIELD and LOWRY, Trans. Far. Soc. **6**: 98–103. BOUSFIELD, Phil. Trans., Series A, **218**: 119–156. 1919.

[4] BAXTER, Journ. Amer. Chem. Soc. **33**: 912. 1911. **38**: 80. 1916.

ZOOLOGY.—Typhlops lumbricalis *and related forms.* DORIS M. COCHRAN, National Museum. (Communicated by Dr. L. STEJNEGER).

In 1920 K. P. Schmidt discussed[1] the status of the Porto Rican blind-snake, assigning to it the name *Typhlops richardii* Duméril and Bibron. He compared it with the Cuban form and found constant differences in scalation.

The collection of the so-called *Typhlops lumbricalis* in the National Museum had never been studied critically, and as this collection contains specimens from Guadeloupe, St. Thomas, Abaco, and Jamaica, localities which Schmidt did not include in his study for lack of specimens, a thorough examination of this material has seemed advisable.

The scale-counts of the six Porto Rican specimens in the National Museum bear out Schmidt's observations very well. He found that there were 22 scale-rows around the anterior portion of the body in the fourteen specimens at his disposal, and he counted 365 to 415 scales from the head to the tip of the tail. In my Porto Rican specimens I find the same number of scales around the body, while the minimum and maximum numbers in the longitudinal count are about 370 and 420. The four specimens from Jamaica in the National Museum have also 22 scale-rows around the body anteriorly, with a minimum and maximum count from head to tail of about 405 to 425 scales. Five specimens from St. Thomas, likewise with 22 scale-rows, have from 335 to 365 scales counted the length of the body.

It may be noted that the blind-snakes from these three islands—St. Thomas, Porto Rico, and Jamaica—have the same number of scale-rows around the body, while the number of scales counted from head to tail forms a graded series, the lowest count—335 to 365—coming from the easternmost island, St. Thomas, while Porto Rico, close by in a westerly direction, has from 365 to 420, and Jamaica, further still to the west, has a minimum count of not less than 405 and a maximum of 425.

The Cuban specimens examined by Dr. Schmidt had 20 scales around the anterior part of the body; on my larger series of 19 specimens I find the same number. From head to tail he counted 270 to 325 scales; on my series there are 255 to 340 scales. The three specimens from Santo Domingo in the National Museum have about 270 to 305, and 20 rows around the body, agreeing with the Cuban form in these respects. The single specimen from Abaco Island, one of the Bahama islands, mentioned by Cope[2]

[1] Ann. N. Y. Acad. Sci. **28**: 195. 1920.
[2] Proc. U. S. Nat. Mus. **10**: 439. 1887.

has a similar scale-formula—20 scale-rows, 260 scales the length of the body, 11 under the tail—and undoubtedly belongs to the same group.

An increase in the number of scales from head to tail, accompanying the westerly distribution, is to be noted likewise in this group of blind-snakes characterized by the possession of 20 scale-rows around the body. Those from Santo Domingo have no more than 270; those from the eastern end of Cuba have between 255 and 285; while from the western end (Havana and Pinar del Rio Provinces) there are between 270 and 320. Whether a large series of specimens will bear out these observations is a question to be settled by future collectors.

The single recorded specimen from Navassa Island, the type of Cope's *Typhlops sulcatus*,[3] has 20 scale-rows anteriorly around the body, and about 395 scales from head to tail. The suture extending from the nostril to the lateral edge of the rostral plate, which is present in snakes from all the other islands, is lacking in this specimen in spite of Cope's statement to the contrary. It is better to regard *Typhlops sulcatus* as a valid species until more material is received and the status of this form can be satisfactorily settled.

In regard to Dr. Stejneger's establishment[4] of the validity of *Typhlops dominicana* from the island of Dominica, a species characterized by the possession of 24 scale-rows and a very wide rostral, it is interesting to note that our five specimens sent by L. Guesde from Guadeloupe are undoubted examples of *T. dominicana*. The rows around the body are 24 in number, the scales from head to tail range between 400 and 440 in this series, and the rostral is noticeably very wide in every specimen.

The blind-snake found in Porto Rico and Jamaica must be called *Typhlops jamaicensis* (Shaw). The description of *Anguis jamaicensis* by Shaw[5] is based exclusively on the accounts of Browne and Seba. Shaw himself suspected that his "Jamaica slow-worm" was not the same as the Linnaean species, as he definitely questions the reference to *Anguis lumbricalis*. The comparison of the Jamaican species with the Cuban species having the low scale-count proves that his suspicion was well-founded.

In the use of the name *Typhlops lumbricalis* for the Jamaican blind-snakes Schmidt follows the example of Dumeril and Bibron, who considered that the Linnaean name of *T. lumbricalis* was based upon the Jamaican *Amphisbaena subargentea* of Browne. The facts, however, are as follows:

In the tenth edition of Systema Naturae[6] the characterization of *lumbricalis* is "230–7." The first reference given by Linnaeus under the name *lumbricalis* is the *Museum ichthyologium* of Gronovius, Tom. II, 1758, p. 52, no. 3, followed by a reference to Browne's *History of Jamaica* and to Seba's *Thesaurus*. The description by Gronovius of a specimen in his own col-

[3] Proc. Acad. Nat. Sci. Philadelphia **1868**: 128.
[4] Rep. U. S. Nat. Mus. **1902**: 687. 1904.
[5] Gen. Zool. **3**[2]: 558.
[6] **1**: 288. 1758.

lection is a very complete and satisfactory one, considering the time at which it was made. It begins with the polysyllabic name, "Anguis squamis abdominalibus ccxxx, et squamis caudalibus vii." This specimen with the small number of scales is therefore the one upon which Linnaeus bases his species *Anguis lumbricalis*, hence this name is applicable only to the blind-snakes with a small scale-count—those from Cuba, Santo Domingo and the Bahamas; consequently *T. richardii* must take its place as a synonym of *jamaicensis* Linnaeus took the reference to Browne's and Seba's works directly from Gronovius, but this quotation, of course, does not affect the fact that the specific name is based on a specimen with 237 scales from head to tip of tail. Even the name *lumbricalis* was suggested to him by Gronovius' comparison of this specimen with *Lumbricus terrestris*, the common earth-worm.

Duméril and Bibron described[7] a *Typhlops* collected by Plée and alleged to have come from Martinique. This species, *T. platycephalus*, having 20 longitudinal rows, 350 transverse rows on the body and 12 on the tail, was separated by them from *T. richardii*, having 20 longitudinal rows, 300 to 350 transverse rows, and about 15 on the tail, chiefly because their specimen of *T. platycephalus* had parietals much larger than the scales surrounding the ocular, which was not the case with their examples of *richardii*. In my six Porto Rican snakes I find that this relation is extremely variable, as the parietal in two of the specimens is distinguishable from the surrounding scales by its position alone, while in two others the parietal is about twice as large as the other scales bordering the eye posteriorly and superiorly. In the Cuban specimens I find the same great variability in the size of the parietal. With regard to the type-locality of *platycephalus*, Dr. Stejneger in the *Herpetology of Porto Rico* has shown[8] that the majority of Plée's specimens attributed to Martinique actually came from Porto Rico. As the number of rows around the body in Duméril and Bibron's specimen is given as 20, the count may have been made at the middle of the body, in which case the true maximum would not have been discovered. The number of scales from head to tip of tail, 350 plus 12, is within the limits of *jamaicensis*. The probability is that the type of *Typhlops platycephalus* came from Porto Rico; consequently it may be regarded as a synonym of *jamaicensis*. As Dr. Stejneger has shown[9] in his *Herpetology of Porto Rico* Boulenger's description[10] of what he supposed to be *Typhlops platycephalus* was taken from specimens in the British Museum at that time, which were all from Dominica, and which are now recognized under the name of *Typhlops dominicana* Stejneger.

[7] Erp. Gén. **6**: 293.
[8] Rep. U. S. Nat. Mus. **1902**: 557. 1904.
[9] Rep. U. S. Nat. Mus. **1902**: 687. 1904.
[10] Cat. Snakes Brit. Mus. **1**: 30.

The specimens of *lumbricalis* from Cuba, as well as all of the *T. jamaicensis*, have two postoculars between the parietal and the upper labials. In this respect they differ from the single Navassan and two Santo Domingan specimens, which have but one postocular. The third specimen has two small postoculars on one side of the head. The parietal scale in the Santo Domingan specimens is relatively larger than in either of the two Porto Rican specimens having large parietals. A large series of blind-snakes is needed to determine whether the single postocular and the extremely large parietal are characters sufficiently constant to warrant specific distinction for the Santo Domingan form.

The synonymy of the species is therefore as follows:

TYPHLOPS LUMBRICALIS (Linnaeus)

1758. *Anguis lumbricalis* Linnaeus, Syst. Nat. 10th ed., **1:** 288 (type-locality, America).
1830. *Typhlops cubae* Bibron, in Sagra's Hist. Fis. Pol. Nat., **4:** Rept., p. 122, *pl. 22* (French ed. p. 204) (type locality, Cuba).

TYPHLOPS JAMAICENSIS (Shaw)

1802. *Anguis jamaicensis* Shaw, Gen. Zool. **3:** 588 (type locality Jamaica).
1844. *Typhlops richardii* Duméril and Bibron, Erp. Gén. **6:** 290 (type locality St. Thomas).
1844. *Typhlops platycephalus* Duméril and Bibron, Erp. Gén. **6:** 293 (type locality, Martinique, Porto Rico).
1904. *Typhlops lumbricalis* Stejneger, Rep. U. S. Nat. Mus. **1902:** 684. 1904. (Porto Rico.)

TYPHLOPS SULCATUS Cope

1868. *Typhlops sulcatus* Cope, Proc. Acad. Nat. Sci. Philadelphia **1868:** 128 (type locality Navassa Island).

TYPHLOPS DOMINICANA Stejneger

1830. *Typhlops cinereus* Guérin, Icon. Régne Anim., Rept., *pl. 18, f. 2* (Guadeloupe) (not of Schneider, 1801).
1893. *Typhlops platycephalus* Boulenger, Cat. Snakes Brit. Mus. **1:** 30 (Dominica) (not of Duméril and Bibron, 1844).
1904. *Typhlops dominicana* Stejneger, Rep. U. S. Nat. Mus. **1902:** 687. 1904.

ZOOLOGY.—*On the value of nuclear characters in the classification of marine gastropods.*[1] WILLIAM H. DALL, National Museum.

The so-called nucleus in marine gastropods consists of the protoconch, the succeeding larval or nepionic coils, and sometimes a transitional part prefiguring the adult sculpture.

The primal protoconch in *Gastropoda* is a smooth cup gradually increased by growth into the summit of a spiral. It may be small or

[1] Published by permission of the Director of the U. S. Geological Survey.

large but its fundamental character is the same. The succeeding or nepionic portion of the nucleus may remain smooth, or take on sculpture, and in more specialized forms this sculpture may be greatly varied and exhibit numerous degrees of complexity.

The primal protoconch, at first of a horny consistency, in most cases is promptly calcified and remains permanently as the apical point of the nuclear portion of the shell. In many of the species from deep water it is more or less inflated or even mammillary. In others the nepionic part tends by acceleration to disappear, and features characteristic of the adult spire are more or less prefigured in the portion immediately succeeding the protoconch. In the Caricellinae of the Volutidae and possibly in the genus *Stilus* of the Cerithiopsidae, alone the protoconch seems to retain its original uncalcified texture and to be discarded before the nepionic shell leaves its ovicapsule, a trace of its original presence being left in the form of a sharp point where calcification began on the axis of the primal coil.

In a much smaller group of gastropods the nucleus remains permanently horny and usually of a brownish color contrasting emphatically with the succeeding calcified adult sculpture which follows by an abrupt transition.

This horny nucleus may remain without sculpture (*Dolium*); with spiral lines furnished with prominent dermal hairs (*Fusitriton*); of with sculpture of varied complexity. In the latter case the sculpture is most commonly an oblique reticulation, more or less fine, with a less evident fine spiral striation. Where the reticulation is coarse the interstices are more conspicuous and in worn specimens give a punctate effect to the surface. One set of the oblique threads may be stronger than the other, giving a ribbed look to the nepionic surface, or the oblique sculpture may be weaker, or even absent, while the spiral sculpture assumes prominence or concentrates into one or more carinae.

In common with most students of the mollusca for some years I have regarded the nucleus characters as more or less indicative of genetic affinity, but recently having had to work over large numbers of deep water species, especially toxoglossate forms, and to utilize Hedley's fine monograph of the Australian Turridae, I have found this view to involve so many apparently preposterous combinations of unlike things and separation of similar things, that I have come to the conclusion that this view cannot be maintained.

The simple smooth inflated protoconch as a modification of the original form is found among others to occur in the deep water species of the following very diverse groups:

TOXOGLOSSA

TURRITIDAE, CANCELLARIIDAE

RHACHIGLOSSA

OLIVELLIDAE, MARGINELLIDAE, FASCIOLARIIDAE, CHRYSODOMIDAE, COLUMBELLIDAE, MURICIDAE

GYMNOGLOSSA

MELANELLIDAE

TAENIOGLOSSA

TRIVIIDAE, TRIPHORIDAE, CERITHIOPSIDAE, TRICHOTROPIDAE, RISSOIDAE

Further search would doubtless add other families to this list.

The most common form of the horny nucleus with oblique reticulation was originally caught in the tow net and described as a genus *Sinusigera*, and I have therefore utilized the name by calling it the *Sinusigera* nucleus.

The form dehiscent in the ovicapsule can be denominated the *Caricella* nucleus. The smooth or nearly smooth form which occurs in the Tun and Helmet shells might be named the *Tonna* nucleus.

Lastly, the elevated, spirally ciliated form found in *Austrotriton* and probably in other *Cymatiidae*, can be named the *Triton* nucleus.

The following groups among others include species with horny nuclei:

TOXOGLOSSA

TURRIDAE

RHACHIGLOSSA

CARICELLINAE, MURICIDAE

TAENIOGLOSSA

TONNIDAE, CASSIDIDAE, CYMATIIDAE, TRIPHORIDAE, CERITHIOPSIDAE, TRICHOTROPIDAE

It is a material fact that no sedentary, parasitical, or exclusively littoral species is known to have a *Sinusigera* nucleus. Also that the inflated simple nucleus is found chiefly among species living in relatively deep water and becomes more general as we compare species of whatever genus from still deeper water. No instance is known to me where species with a well developed nucleus of this type has a floating larva.

The species with a *Sinusigera* nucleus, as far as known, float in the larval state, and the horny shell in cases where a suitable substratum is inaccessible sometimes reaches as many as seven whorls when it would normally have only half as many.

The horny shell destitute of limy coating is lighter than the calcified forms and thus adapted to the floating status. Carried by currents, genera having this type of nucleus are distributed widely. Those whose nepionic life is chiefly confined to the fluids in the ovicapsule, are comparatively restricted in range.

The conclusions indicated are that the differences above specified are due to adaptation for a floating larva or the reverse, and should not be regarded as genetically fundamental.

When two marine forms of similar anatomical structure exhibit different nuclei, I conclude that the adaptive modification is not of serious value in classification, and in most cases should not be considered as of more than sectional or subgeneric importance. The parallel occurrence of similar nuclei in widely different groups of families is obviously no indication of genetic affinity.

The variations in sculpture of forms deriving from the *Sinusigera* type, are probably, like the sculptural variations of the adult shell, of little more than specific value.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ENTOMOLOGICAL SOCIETY

358TH MEETING

The 358th meeting of the Entomological Society was held May 3, 1923, with Vice-President Böving in the chair and 35 persons present.

Program: G. F. WHITE: *Insect deseases.* The speaker gave a survey of the field of insect deseases, pointing out the different groups into which the causative agents are classified, the four main divisions of the study of insect pathology, and the qualifications that students of the subject should have. He showed that the field of the pathologist touches that of the bacteriologist, the protozoologist, the mycologist, the helminthologist, and the entomologist. It practically monopolizes a large portion of two other fields, those limited to filterable viruses and certain cell inclusions. The relative importance of the different phases was indicated graphically by diagrams.

J. M. ALDRICH: *A unique egg-laying apparatus in a tachinid fly.*

A. C. BAKER, *Recording secretary pro-tem.*

SPECIAL MEETING

A special meeting was held by invitation in the Laboratory of Bee Culture at Somerset, Maryland, May 23, 1923. Eighteen persons were present. The following papers relating to bee culture and the work of the Laboratory

were read: E. F. PHILLIPS: *Investigations in progress;* A. P. STURTEVANT: *The time of attack of the brood diseases;* E. L. SECHRIST: *Educational work of the Laboratory;* W. J. NOLAN: *Variation in brood population;* J. I. HAMBLETON: *Temperature measurements in the hive.*

Visits were then made to the following exhibits: temperature measurement apparatus and charts; photographic equipment for determining brood population; collection of samples of honey; *Acarapis woodii,* the cause of the Isle of Wight disease of bees; samples of the various brood diseases; spectro-photometer for measuring color of honey; charts showing variation in brood population throughout the season; drawings of honeybee anatomy by Snodgrass.

S. A. ROHWER, *Recording secretary pro-tem.*

359TH MEETING

The 359th meeting was held October 4, 1923, with President Howard in the chair and 64 persons present.

Program: L. O. HOWARD: *A recent trip to Europe.* The speaker attended the International Congress of Agriculture at Paris, the International Conference on the Olive Fly at Madrid, and the International Conference of Phytopathologists and Economic Entomologists at Wageningen, Holland. He also visited numerous institutions in England, France, Italy, and Belgium. This talk was illustrated by lantern slides, many of which showed European entomologists well known to members of the Society by correspondence and by their published works.

Dr. ALDRICH announced that *Braula coeca* Nitzsch, the so-called bee-louse of Europe, has been found in abundance in Maryland apiaries by Mr. Secrist, of the Bee-keeping Laboratory of the Bureau of Entomology. The species has been imported on queens before, a single specimen at a time, but was not known to be established until last month. Recent papers by Skaife[1] and by Arnhart[2] on the biology of the species are of great importance. From these it appears that eggs are laid on the comb, and the larvae make tunnels in the wax cappings of honey and brood cells; pupae were found in a brood comb, beside that of the drone in the same cell. Thus it appears that the insect is not pupiparous at all. Professor Bezzi recognized[3] this fact as early as 1916, when he placed the genus as a subfamily of Phoridae. The nearest relatives, in the opinion of Dr. Aldrich, are the wingless myrmecophilous and termitophilous Phoridae, although *Braula* may well be placed in a distinct family. Dr. Phillips said that apparently the insects do very little harm in the bee colony. They may congregate on queens, to which they are partial, but even this is rare.

Brief remarks were made by Drs. POSPELOV and BORODIN, of Russia, Dr. HUBRECHT, chargé d'affaires of the legation of The Netherlands, and Prof. G. A. Dean.

CHAS. T. GREENE, *Recording secretary.*

[1] Trans. Royal Soc. So. Africa **10**: 41–48. 1921.
[2] Zool. Anz. **56**: 193–197. 1923.
[3] Natura **7**: 174. 1916.

SCIENTIFIC NOTES AND NEWS

Invitations have been received by local societies to participate in the Third Pan American Scientific Congress, which meets at Lima, Peru, on November 16, 1924. It is desired that one or more official delegates be appointed to represent societies at this Congress. Members of the ACADEMY or of the affiliated societies who expect to be in Peru during November of this year are requested to communicate with some officer of the Academy.

The Secretary General of the Congress is Engineer José J. Bravo, Lima, Peru.

The Congress will comprise nine sections, as follows: (1) Anthropology, history, and related sciences; (2) Physics, mathematics, and related sciences; (3) Mining, metallurgy, economic geology and applied chemistry; (4) Engineering; (5) Medicine and sanitation; (6) Biology, agriculture, and related sciences; (7) Private, public, and international law; (8) Economics and sociology; (9) Education.

It will be recalled that the Second Pan American Scientific Congress sat in Washington from December 27, 1915 to January 8, 1916.

The Smithsonian Institution is assisting in the rehabilitation of Japanese libraries destroyed during the earthquake. Recently a shipment of 68 boxes of publications was sent to the University of Tokyo. This included a large number from the Library of Congress.

DR. T. NAKAI, of the Tokyo Imperial University, Government Botanist of Chosen, visited the Smithsonian Institution last month to study specimens of the Perry Expedition in the National Herbarium.

The Petrologists Club met at the home of F. E. WRIGHT on March 18, 1924. G. W. MOREY reviewed Niggli's book on *Die Leichtflüchtige Bestandteile im Magma*. W. F. FOSHAG spoke on *Genesis of minerals in lithophysae*, and C. S. ROSS on *Minerals in cavities of the volcanic rocks of the San Juan region*.

BENJAMIN A. COLONNA, an officer of the Coast and Geodetic Survey from 1870 to 1885, died in Washington on March 11, 1924, at the age of 80. He was promoted through all grades of the service, but was disabled by an accident while on field work in the Strait of Fuca, and never completely recovered his health. In recent years he had been engaged in private business in Norfolk and Washington.